CLAIMS

What is claimed is:

1. A capacitor based pulse forming network comprising:

a plurality of inductors adapted to be coupled to a load;

a plurality of capacitor units;

a plurality of switches, each switch coupling a respective capacitor unit to a respective inductor, wherein multiple capacitor units are coupled to each inductor by separate switches; and

the plurality of switches are adapted to non-simultaneously discharge the multiple capacitor units to provide non-simultaneous pulses through a given inductor to the load and not through other inductors;

wherein the non-simultaneous pulses form at least a portion of an output pulse waveform to the load.

2. The network of claim 1 further comprising:

a charging circuit coupled to each capacitor unit.

3. The network of claim 1 further comprising:

a timing controller coupled to each switch, the timing controller adapted to output a signal at an appropriate time to cause each switch to discharge a respective capacitor unit.

4. The network of claim 1 further comprising:

an anti-reversing diode coupled to each inductor, the anti-reversing diode coupled to a given inductor for limiting voltage reversal across discharged capacitor units.

5. The network of claim 1 wherein the non-simultaneous pulses through the given inductor do not overlap in time with each other.

6. The network of claim 1 wherein the non-simultaneous pulses through the given inductor are non-simultaneous with pulses through the other inductors.

7. The network of claim 1 wherein plurality of switches are adapted to sequentially discharge the plurality of capacitor units.

8. The network of claim 1 wherein the plurality of switches are adapted to discharge the last capacitor units in a discharging sequence at a successively higher frequency to produce the last pulses of a pulse sequence, such that each of the last pulses resonates at a higher frequency odd harmonic relative to a preceding pulse, such that sum of the last pulses substantially comprises a square waveform, wherein resulting a faster shut off time for the output pulse waveform.

9. The network of claim 1 wherein each switch comprises one or more solid state switches.

10. The network of claim 1 wherein each switch comprises one or more electromechanical switches.

11. The network of claim 1 wherein each switch is commutated off after the given capacitor unit has discharged.

12. The network of claim 1 wherein a switch is commutated off by closing a subsequent switch coupled to another capacitor unit coupled to the same inductor.

13. The network of claim 1 wherein each capacitor unit comprises one

or more capacitors.

14. The network of claim 1 wherein groups of the multiple capacitor units coupled by a respective switch to a respective inductor each comprise one of a plurality of energy storage modules.

15. The network of claim 14 wherein the plurality of switches are adapted to:

sequentially discharge a first capacitor unit of each energy storage module over time to provide a first pulse through each inductor to the load and not through inductors of other energy storage modules; and

sequentially discharge, after beginning the sequential discharge of the first capacitor unit of each energy storage module, a second capacitor unit of each energy storage module over time to provide a second pulse through each inductor to the load and not through the inductors of the other energy storage modules.

16. The network of claim 14 wherein the plurality of switches are adapted to:

sequentially discharge a first capacitor unit of each energy storage module over time to provide a first pulse through each inductor to the load and not through inductors of other energy storage modules; and

sequentially discharge, after beginning the discharge of the first capacitor unit of the last sequential energy storage module, a subsequent capacitor unit of each energy storage module over time to provide a subsequent pulse through each inductor to the load and not through the inductors of the other energy storage modules, wherein the subsequent pulse does not overlap in time with the first pulse of each energy storage module.

17. The network of claim 16 wherein the plurality of switches are

adapted to:

repeat the sequential discharge of additional subsequent capacitor units to provide additional subsequent pulses through each inductor to the load until all of the plurality of capacitor units have been discharged.

18. The network of claim 16 wherein the plurality of switches are further adapted to:

sequentially discharge a last capacitor unit of a given energy storage module at a higher frequency such that a last pulse of the last capacitor unit resonates at a higher frequency odd harmonic relative to a last pulse of a sequentially preceding last capacitor unit of a sequentially preceding energy storage module, wherein causing a faster shut off time for the output pulse waveform.

19. A method for providing a pulse waveform to a load comprising:

charging a plurality of capacitor units, wherein multiple capacitor units are coupled to each of a plurality of inductors, each inductor coupled to the load; and

non-simultaneously discharging the multiple capacitor units to provide non-simultaneous pulses through a given inductor to the load and not through other inductors;

wherein the non-simultaneous pulses form at least a portion of the pulse waveform.

20. The method of claim 19 further comprising:

receiving timing signals at appropriate times to trigger the non-simultaneous discharging.

21. The method of claim 19 further comprising:

limiting voltage reversal across discharged capacitor units.

22. The method of claim 19 wherein the non-simultaneous pulses through the given inductor do not overlap in time with each other.

23. The method of claim 19 wherein the non-simultaneous pulses through the given inductor are non-simultaneous with pulses through the other inductors.

24. The method of claim 19 further comprising:

sequentially discharging the plurality of capacitor units.

25. The method of claim 19 wherein the non-simultaneous discharging step comprises:

sequentially discharging the multiple capacitor units to provide sequential pulses through the given inductor to the load and not through other inductors.

26. The method of claim 19 further comprising:

discharging the last capacitor units in a discharging sequence at a successively higher frequency to produce the last pulses of a pulse sequence, such that each of the last pulses resonates at a higher frequency odd harmonic relative to a preceding pulse, such that sum of the last pulses substantially comprises a square waveform, wherein resulting a faster shut off time for the output pulse waveform.

27. The method of claim 19 wherein the non-simultaneously discharging step comprises:

non-simultaneously closing respective switches, each switch coupling each of the multiple capacitor units to the given inductor.

28. The method of claim 27 further comprising:

opening each switch through commutation.

29. The method of claim 27 wherein closing a respective switch of the multiple capacitor units commutates open a previously closed switch of the multiple capacitor units.

30. The method of claim 19 wherein groups of the multiple capacitor units coupled to a respective inductor each comprise one of a plurality of energy storage modules.

31. The method of claim 30 further comprising:

sequentially discharging a first capacitor unit of each energy storage module over time to provide a first pulse through each inductor to the load and not through inductors of other energy storage modules; and

sequentially discharging, after beginning the sequential discharging of the first capacitor unit of each energy storage module, a second capacitor unit of each energy storage module over time to provide a second pulse through each inductor to the load and not through the inductors of the other energy storage modules.

32. The method of claim 30 further comprising:

sequentially discharging a first capacitor unit of each energy storage module over time to provide a first pulse through each inductor to the load and not through inductors of other energy storage modules; and

sequentially discharging, after beginning the discharging of the first capacitor unit of the last sequential energy storage module, a subsequent capacitor unit of each energy storage module over time to provide a subsequent pulse through each inductor to the load and not through the inductors of the other energy storage modules, wherein the subsequent pulse

does not overlap in time with the first pulse of each energy storage module.

33. The method of claim 32 further comprising:

repeating the sequentially discharging the subsequent capacitor units for additional subsequent capacitor units to provide additional subsequent pulses through each inductor to the load until all of the plurality of capacitor units have been discharged.

34. The method of claim 32 further comprising:

sequentially discharging a last capacitor unit of a given energy storage module at a higher frequency such that a last pulse of the last capacitor unit resonates at a higher frequency odd harmonic relative to a last pulse of a sequentially preceding last capacitor unit of a sequentially preceding energy storage module, wherein causing a faster shut off time for the output pulse waveform.

35. A capacitor based pulse forming network comprising:

means for charging a plurality of capacitor units, wherein multiple capacitor units are coupled to each of a plurality of inductors, each inductor coupled to the load; and

means for non-simultaneously discharging the multiple capacitor units to provide non-simultaneous pulses through a given inductor to the load and not through other inductors;

wherein the non-simultaneous pulses form at least a portion of the pulse waveform.